

Analytical successes begot new demands
A CAEN Science Update Page 30

Chemical &
Engineering

NEWS

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Big-volume acids

Profit hopes rest on phosphate exports

A Key Chemicals Review Page 12

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Cover: Sulfuric acid unit at Freeport
Minerals' phosphoric acid complex at
Uncle Sam, La.

Chemical & Engineering

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Science Update

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ACS News

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Exports underpin high acids production

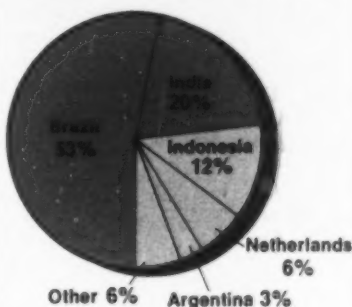
Despite slowed market for phosphates in U.S., resurging exports demand is shielding phosphoric and sulfuric acids from recession so far

These days, exports of phosphoric acid and its derivatives are everything. Producers of phosphoric acid and supporting producers of sulfuric acid would be in considerable difficulty without the current export boom.

In 1980, exports of one kind or another of phosphorus-containing compounds will account for a third of all U.S. production of phosphoric acid, which, in turn, takes about two thirds of sulfuric acid produced in the U.S. Specifically, phosphate exports this year will total about 3.9 million tons (in terms of P_2O_5 , the common measure) out of a total 10.3 million tons of P_2O_5 as phosphoric acid.

To a large extent, this unusually high level of exports results from a lackluster spring fertilizer season in the U.S. Without the surge in exports, U.S. production of phosphoric acid in 1980 would be off by a significant amount, possibly 10%.

Most U.S. phosphoric acid exports go to Brazil, India



Jan-Apr 1980 P_2O_5 exports = 205 million tons

Note: Fertilizer-grade phosphoric acid only, excluding superphosphoric acid to the Soviet Union. Source: Commerce Department

Exports of all kinds of phosphate materials are expected to be up 15% at least (in terms of P_2O_5) over exports in 1979 of a little more than 3 million tons. Some in the industry say that exports could be even higher if material were available.

The importance of exports of phosphate materials to the chemical industry is becoming recognized outside this industry segment. In 1980 the value of these materials—

acid and derivatives—will exceed \$1 billion out of total exports of a bit more than \$20 billion for all chemicals and allied products. Ten years ago, the phosphoric acid export business scarcely existed, and derivative phosphate exports were worth about a tenth of their present value.

Although fast-rising demand for phosphate materials throughout the world is spurring growth in U.S. exports, price remains important. Earlier this year, phosphoric and sulfuric acid producers were expecting a strong U.S. market for phosphate fertilizers (C&EN, Feb. 25, page 10). Prices of some materials such as DAP rose 30% to about \$260 per ton.

At this price, the major foreign buyers of DAP held off and watched for actual sales prices during the big spring market in the U.S. When U.S. farmers cut their buying and dealers didn't order, producers slowed plant operations and cut prices. Then foreign buyers jumped in.

Depending on weather conditions in major foreign consuming areas of phosphate materials, part of the increased exports of phosphate could go into inventory. Hence, some producers suggest that 1981 could see only minor growth, if any, in exports. Overbought foreign phosphates have been a problem in the past.

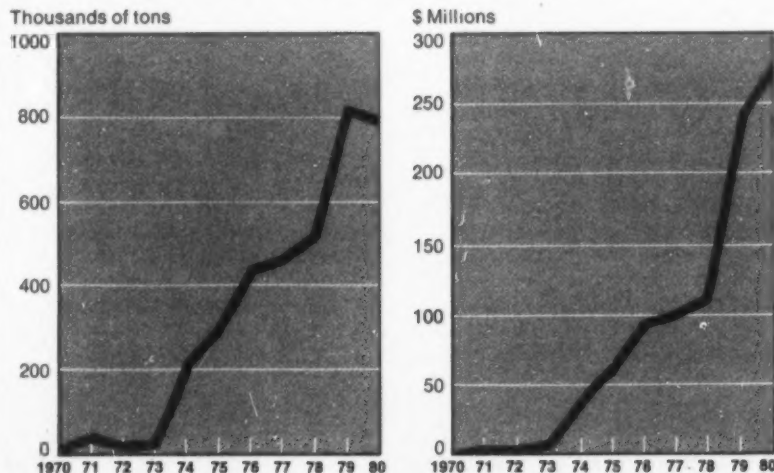
Longer term, most phosphate producers expect the foreign business growth to continue. Many U.S. producers are putting money on this expectation by planning large increases in phosphoric acid plant capacity. Even bigger capacity increases are due in basic phosphate rock mining capacity.

As yet, no big warning flags have gone up over the rash of actual or proposed expansions in phosphoric acid. Perhaps the current high rate of return on phosphate chemicals has dimmed the memory of the difficult times for the phosphate industry caused by overbuilding in the mid-1970's. Another difficult period might occur just a decade later in the mid-1980's, some observers fear, especially if potentially large foreign phosphate developments finally get moving.

For details of the immediate outlook for sulfuric and phosphoric acids, see the following pages.

Bruce Greek, Houston

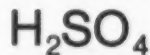
Phosphoric acid exports have risen dramatically



Sources: Commerce Department, industry, and C&EN estimates

Key Chemicals

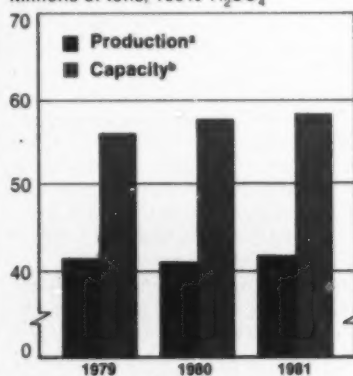
Sulfuric acid



- Demand stalled
- Capacity rising
- Prices rising

PRODUCTION

Millions of tons, 100% H_2SO_4



^a From all sources. ^b First quarter.

HOW MADE

Elemental sulfur burned to dioxide, catalytically oxidized to trioxide, and reacted with water; sulfur dioxide from smelter or other sources oxidized similarly and converted to acid

MAJOR END USES

Fertilizers 65%, chemical manufacture, metals and ores refining, and petroleum refining, each 5%

FOREIGN TRADE

Exports—small, under 100,000 tons a year, imports—small, under 500,000 tons a year

PRICES

Posted contract prices for 100% H_2SO_4 \$75 to \$85 a ton

COMMERCIAL VALUE

\$3.25 billion for total production, 1980

At this time, plant location means much in how well sulfuric acid is doing. At some places, U.S. plants are being operated at low levels or not at all, as in the case of copper smelters shut down because of the copper strike. At other sites, particularly south Florida, sulfuric acid plants are operating at maximum levels, even more than nameplate capacity.

This range of operating levels results from the current state of the U.S. economy. In general, industrial uses of sulfuric acid are well down because of the recession. Fertilizer use, roughly two thirds of the total, is strong—largely because of strong export demand for derivative phosphate fertilizer.

Earlier this year, overall fertilizer use of sulfuric acid slumped as inventories of finished fertilizers increased and export buyers waited for lower prices. Once lower quotes on phosphates showed up this spring, foreign orders jumped, although the spring season in the U.S. was disappointing.

Although overall fertilizer use of sulfuric acid has resurged since mid-May, industrial uses remain at low levels. As a result, total production of sulfuric acid during 1980 will do well to match 1979 production of about 41 million tons (in terms of 100% H_2SO_4).

Reduced industrial demand could continue throughout 1980. This plus reduced output of smelter acid could drag total sulfuric production in 1980 a bit below that of 1979, even with a small gain in consumption of sulfuric in making phosphate fertilizers.

The outlook for 1981 production remains almost as scrambled. Factors influencing future sulfuric acid output range from the shape of the economic recovery to the state of oncoming production capacity in other parts of the world. Other factors include current fertilizer inventory building, both in the U.S. and foreign countries; pricing strategies; and shipping facilities.

Most producers expect industrial uses of sulfuric acid to increase somewhat during the third and fourth quarters of 1980 although it will fall quite short of first-quarter 1980 levels. With almost half of the third quarter now gone, industrial demand remains sluggish, so hopes are fading for improvement this quarter.

If industrial applications do come up to past levels, and fertilizer use posts its expected 3% gain for 1981, production of sulfuric acid in 1981 will exceed 1980 2% or so to reach a total of 41.8 million tons.

Such growth also assumes that scheduled expansions of plant capacity over the next year are on time and that smelter acid production about equals 1980 levels. Total sulfuric acid capacity is expected to climb half a million tons during 1980 to reach 58 million tons in first-quarter 1981.

Exports of phosphate fertilizers could be the real key to 1981 sulfuric acid production. Very strong now, these exports still depend on the amount of competition from local and imported phosphates in countries where U.S.-produced phosphates are now being shipped.

The optimists among U.S. fertilizer industry sources say that fast-rising demand for phosphate fertilizers throughout the world not only will take care of new capacity in other countries but will improve operation of existing capacity. Pessimists look at the heavy slate of U.S. and potential foreign phosphate expansions in 1982 and 1983 with some alarm, although not for 1981.

Competition from foreign producers could stiffen further if they get reliable supplies of sulfur to make the necessary sulfuric acid for their phosphate operations and especially if the country has substantial supplies of phosphate rock. Morocco is the most important such candidate, but it has had long-standing political and technical problems in realizing its potential. No resolution is in sight.

Sulfur recovered from natural gas associated with oil production in the Middle East will become available as raw material for sulfuric acid, but some sources think that the rising demand for phosphates could take up all this sulfur and more. For the near term, a draw-down of existing sulfur supplies appears the main way for new and old producers worldwide to make enough acid to meet demand for phosphate fertilizers. This could keep rising cost pressure on sulfuric and phosphate producers and make strong export demand even more important.

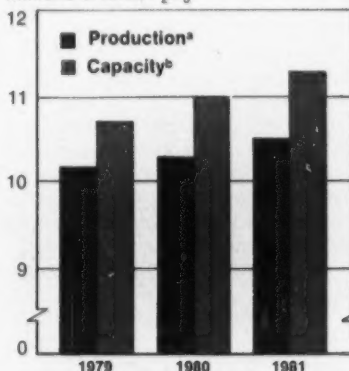


Phosphoric acid

- **Export demand big**
- **Capacity up a bit**
- **Prices to rise**

PRODUCTION

Millions of tons, P_2O_5



^a Both wet process and furnace acid.
^b First quarter.

HOW MADE

Reaction of phosphate rock and sulfuric acid; burning of elemental phosphorus and subsequent reaction with water

MAJOR DERIVATIVES

Ammonium phosphates 60%, triple superphosphates 20%

MAJOR END USES

Fertilizer 85%, detergents 5%, animal feeds 5%

FOREIGN TRADE

Exports—could exceed 800,000 tons of P_2O_5 , imports—very small

PRICES

\$350 per ton (100% P_2O_5) for fertilizer

COMMERCIAL VALUE

\$3.6 billion for total production, 1980

Phosphoric acid producers are going full tilt, despite a dip in the U.S. market for downstream phosphate fertilizer. The reason is a rush this summer by foreign phosphate buyers.

Currently, most wet-process phosphoric acid plants are being run at or above nameplate capacity. Production is expected to remain high during the rest of 1980 but probably down somewhat from the present superheated levels.

Early in 1980, phosphoric acid production was running all out (C&EN, Feb. 25, page 12). Then came a slump in demand, especially in the U.S., during the spring months. Producers realized that dealer inventories were indeed high and that foreign buyers would not pay the exalted prices that had been reached for phosphate derivatives.

Producers reacted by shutting down plants for maintenance. At the same time, prices dropped for export fertilizer, and dealers sold their inventories more than expected. As a result, inventories began to disappear in mid-May.

More attractively priced exports of phosphate fertilizers surged in June and continued strong in July, further pulling down inventories at producers' plants. Some of these inventories were being held against an anticipated repeat of last fall's early buying spree by U.S. phosphate customers.

So the word went out at phosphoric acid producers to hurry the maintenance and get the plants running again. Since many plants were then in better shape, production jumped strongly and is expected to continue at this pace long enough to put 1980 production of phosphoric acid slightly over 1979 production. The gain will be perhaps 1% to 10.3 million tons (in terms of P_2O_5) from 10.2 million tons in 1979.

The gain in production will come entirely in wet-process acid, the type used in fertilizer. Furnace-acid production probably will continue its slow decline, which will require wet-process acid to increase more than the 1 to 2% gain forecast for total production.

The growth in phosphoric acid production may continue through 1981 under the same propulsion. Total production next year could be up again 2% or so, with the gain again coming entirely in wet-process acid. Since the U.S.

market has been soft, gains in production now and next year depend mainly on international demand.

All but a small quantity of phosphate fertilizers are based on phosphoric acid, which is made by reacting phosphate rock of varying quality with sulfuric acid. Long-term growth for phosphoric acid seems assured, especially now that more and more raw-material sulfur for sulfuric acid is becoming available as by-product from oil and gas production and from sulfur dioxide cleanup in industrial and utility smokestacks.

Phosphoric acid producers sense this, too, and have committed a lot of new investment for capacity to come on stream in two to three years. This year, U.S. capacity for phosphoric acid will grow very little, no more than 3% based on expansion announcements.

However, most new plants are over-designed by varying amounts depending on the kind of equipment, management philosophies, and expectations of quality of rock to be used. Thus an accurate figure for capacity is elusive.

A clue to the overcapacity of wet-process phosphoric acid plants comes from comparison of production and capacity. If furnace-acid capacity of about 1.4 million tons (of P_2O_5) is taken out of the total, about 9.5 million tons of capacity remains as wet-process. Similarly, if 1980 furnace-acid production of about 700,000 tons is deleted from the total, wet-acid production would appear to be about 9.6 million tons (of P_2O_5).

On the basis of this calculation, which excludes production from new capacity added during the year, the wet-process acid plants are operating at an average of 101% of nameplate capacity. This makes no allowance for maintenance time, even though some plants were down more than two weeks in late spring. Hence, skillful phosphoric acid plant operators may be able to coax 10% more than top-rated production out of their units for substantial parts of the year.

However, continued good business in phosphoric acid is not guaranteed. The spring slump in U.S. phosphates could be a warning about U.S. demand, and the summer bulge in foreign buying will need watching lest it turn out to be a one-time effect of a temporary price fluctuation.